

QUARTERLY PROGRESS REPORT
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Marshall Space Flight Center
Safety and Mission Assurance Mission Services Contract
NAS8-00179

Approved:



Randall S. Reed, Program Manager
MSFC S&MA Mission Services

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Hernandez Engineering, Inc.
Building 4471
Marshall Space Flight Center, AL 35812

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1.0 INTRODUCTION

Hernandez Engineering, Inc. (HEI) successfully performed all required activities and tasks, as described in this report, in fulfillment of their Safety and Mission Assurance (S&MA) Mission Services Contract (NAS8-00179) with NASA's Marshall Space Flight Center (MSFC). This report covers a three-month period of the contract's third quarter of the first year: April 2001 through June 2001.

2.0 GENERAL MANAGEMENT

2.1 Data Requirements

The third quarter of the S&MA Mission Services contract was successfully completed on June 2001. All Data Requirements (DR) Documents were submitted on or ahead of schedule throughout the quarter. They included DRD 875CD-001 On-Site Employee Location Listing; DRD 875MA-002 Financial Management Reports; DRD 875MA-003 Progress Reports (Monthly/Quarterly); DRD 875MA-006 Operations Plan, Problem Assessment Center (PAC); DRD 875MA-007 Quarterly Open Problems List; DRD 875MA-008 Monthly Newly Opened/Closed Problem Summary; DRD 875SA-002 Mishap and Safety Statistics Reports.

2.2 Personnel Status

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3.0 BUSINESS MANAGEMENT

We have experienced no financial or business management problems during this period. We attribute this to close attention to details, effective use of established controls designed to efficiently respond to program changes---both anticipated and unexpected---and the continuing support of our corporate financial group's dedicated efforts at controlling overhead expenses.

The contract continues to have a total cost underrun at the end of this period---see the June 2001 Monthly Financial Report, DRD 875MA-002, for specifics. Attachment 2, Man-Hours Expended, of this report contains a description, by major task, of the total man-hours expended this period.

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4.0 PERFORMANCE OF WORK AND USE OF FACILITIES AND EQUIPMENT

4.1 Safety

4.1.1 Industrial Safety (IS)

The Industrial Safety (IS) group performed 53 OSHA compliance facility inspections and provided all required reports in a timely manner, meeting the schedule approved by QS30. IS also performed 379 construction site compliance inspections to monitor adherence to OSHA and MSFC safety standards. All facility safety violations were documented in the HAZTRAK databases in order to assure MSFC's compliance with OSHA, NASA, and other consensus code requirements.

IS trained 100% of HEI employees in the CSF Safety Training 2001 and added a full-time experienced Certified Safety Professional (CSP) to assist the VPP Communications and Implementation Teams, and general communication of safety awareness to all MSFC employees. To maintain currency in the OSHA VPP program, IS participated in the OSHA Region IV Voluntary Protection Program Participants' Association (VPPPA) Conference. The IS representative attended the National VPPPA Workshop "Strengthening Star Quality". The conference provided many informative sessions; e.g., Industrial Hygiene Requirements for the Star certification, Federal OSHA Update for Star requirements and Internal Auditing.

As a major significant effort, IS continued to provide extensive support to the planning and review activities associated with the planned new Propulsion Research Laboratory (PRL). Support included: (1) Participation in the weekly meetings, (2) active participation in the Interactive Design Meetings with the new A&E contractor Sverdrup Technology Design Team/Jacobs (Svt&JFI). Meetings were held to discuss with the team the information in the Engineering Study prepared by Bechtel, and (3) performed numerous safety assessments and facility inspections of current hazardous operations scheduled to be relocated in the PRL. An experienced Mechanical Engineer was added to the IS team to strengthen the support for this effort.

IS initiated, completed, or followed up on more than 15 facility safety assessments. Examples included: 1) the Operational Hazard Analysis (OHA) for the P3/P4 Structural Test Article (STA) Transportation and Handling Operation. The OHA was performed in coordination with the MSFC Transportation, Security and EG&G personnel, Johnson Space Center Flight Crew personnel, and DCM operations for the dual crane critical transportation-load lift and convoy from Redstone Army Airfield to MSFC building 4755. The OHA served as the safety guidance at Marshall, 2) On short notice and in coordination with TD71, IS performed an OHA and assisted to develop an operating procedure for lifting the 38K Hydrogen Slush Tank at TS 115. The OHA identified a number of potential hazards due to the close proximity of test equipment and the danger to movement personnel, 3) documented the quantity-distance (QD) and hazard concerns in a hazard assessment for the upcoming Zero-Boiloff Testing (ZBO at Test Stand 300. The Zero-Boiloff/Optical Mass Gauge Testing using the Multipurpose Hydrogen Test Bed (MHTB) is part of the ongoing testing using the MHTB to evaluate controlling cryogenic fluids used for propellants on the Shuttle and other space flight applications and, 4) a quick turn around OHA, reviewing operational procedures and monitoring the operation of lifting the Integrated Truss Segment Shipping Container. The shipping container was brought to MSFC on two semi-trailers, the cover and one trailer and the container on the other, from California to store ISS Hardware as needed

As a significant strength, IS continued to provide dedicated, full-time safety and quality support to the MSFC Test Areas. Support included: 1) participation in the TRR for the Zero Boil-Off testing, 2) reviewing numerous test procedures, TPS's, and lift procedures, 3) participation in safety stand downs, 4) development of a standard lift procedure for critical lifts within the test area and, 5) review of various procedures dealing with equipment for the Propulsive Small Expendable Deployer System (ProSEDS).

IS continued to support the implementation of the NASA lifting standard, NSS 1740.9 by providing day-to-day advice and assistance to S&MA customers. In addition to performing numerous OHA's, IS: (1) served as the MSFC safety monitor on all ISS Transportation and

Handling Operations, (2) developed a Hazard Analysis Checklist for use during the X-38 DPS movement scheduled to take place at Aerojet Facilities in Sacramento, California the end of July 2001, (3) participated in performing a short turn-around special safety inspection of all MSFC mobile cranes to ensure that all safety requirements were available and, (4) administered hands-on proficiency examinations to 15 overhead-crane operators and seven forklift operators in support of the MSFC Personnel Certification Program.

4.1.2 System Safety Engineering (SSE)

System Safety reviewed and provided comments to the Hazard Assessments for High Pressure Oxidizer Turbopump/Alternant Turbopump (HPOTP/AT) and Ground Support Equipment (GSE) Space Shuttle Main Engine (SSME) Block II and supported the System Safety Review Panel (SSRP) at Kennedy Space Center (KSC) for Reusable Solid Rocket Motor (RSRM) Ignition and Safe and Arm Device Phase III.

System Safety provided technical support for the following: STS 105 Orbiter Rollout Review, STS 104 Project Milestone Pre Flight Readiness Review (FRR), STS 104 Program Acceptance Review (PAR), STS 104 FRR Tag up PAR, STS 104 Preflight Assessment, and STS 110 Project Milestone Element Acceptance Review.

System Safety participated in the pyrotechnic hardware procedure and flight certification activities and the External Tank (ET)-117 Liquid Hydrogen (LH2) tank cracks issue resolution efforts. System Safety also provided External Tank (ET) Launch Commit Criteria (LCC) parameters list for the Huntsville Operation Support Center (HOSC) console to support launches.

System Safety continues to evaluate Unsatisfactory Condition Reports (UCRs) and Problem Reports (PRs), as required to support the shuttle program.

4.1.3 Payload Safety

Payload Safety completed/updated 11 safety data packages (SDP)s. The Protein Crystal Growth-Single locker Thermal Enclosure System (PCG-STES) Protein Crystallization Apparatus for Microgravity (PCAM) reflight package and the Node 2 Delta Phase II Hazard Reports were submitted to Johnson Space Center (JSC). The Pore Formation and Mobility Investigation/Solidification Using a Baffle in a Sealed Ampoule (PFMI/SUBSA) Phase II Ground Safety Data Package (GSDP) was submitted to KSC. In addition, Preliminary Hazard Analysis (PHA) was initiated for Evolution of Local Microstructures: Spatial Instabilities of Coarsening Clusters (ELMS). Payload Safety initiated SDPs for Protein Crystal Growth Single locker Thermal Enclosure System (PCG STES) Protein Crystallization Apparatus for Microgravity/Diffusion-controlled Crystallization Apparatus for Microgravity (PCAM/DCAM) reflight for Utilization Flight-1 (UF-1), Materials Science Research Rack (MSRR-1) Integrated Flight Phase III, Microgravity Science Glovebox (MSG) Integrated Flight Phase III, and Multipurpose Logistics Module (MPLM)/Orbiter Reflight. Ground SDPs for STES PCAM/DCAM reflight on UF-1 and Glovebox Integrated Microgravity Isolation Technology (g-LIMIT) Phase II were also initiated. In addition to SDP development, Payload Safety continued development of seven (7) SDPs and reviewed/submitted comments for six (6) SDPs. Payload Safety also updated the Fault Tree Analysis (FTA) for Pore Formation and Mobility Investigation/Solidification Using a Baffle in a Sealed Ampoule (PFMI/SUBSA) and reviewed/commented to the Boeing FTA for the X-37 vehicle. Payload Safety reviewed and

provided comments to the Maximum Design Pressure (MDP) analysis for Vapor Compression Distillation (VCD) Flight Experiment (FE) and the Oxygen Generation Assembly (OGA).

Payload Safety supported the Flight Safety Review Panel (SRP) for Self-Diffusion in Liquid Elements (SDLE) and Water Recovery System (WRS) special topics meetings and the Ground Safety Review Panel (GSRP) for Deorbit Propulsion System (DPS) at the KSC. Payload Safety presented the Laboratory Support Equipment (LSE) Digital Thermometer Phase II hazard reports to the Marshall Payload Safety Readiness Review Board (MPSRRB) and to the flight SRP where all three submitted hazard reports were approved. Payload Safety supported the Small Payload Access to Space Experiment (SPASE) Phase 0/1 reviews by MPSRRB and the SRP. Payload Safety continues completion of the ProSEDS Missile System Prelaunch Safety Package (MSPSP). Payload Safety participated in the following technical meetings: Reliability and Maintainability (R&M) Technical Interchange Meeting (TIM) for Node 2/3, 7A Space Lab Pallet Flight Readiness Review (FRR) and, PCG STES PCAM Preship review. In addition, Payload Safety provided support at JSC during the Flight 6A mission.

4.2 Reliability

4.2.1 Reliability & Maintainability (R&M) Engineering

In support of the Shuttle Projects, significant R&M activities included launch support for the STS-100 mission as well as active participation in anomaly resolution teams related to the SRB Booster Separation Motors and TVC flex hose, RSRM FSM-9 nozzle pocketing, and ET-117 LH2 tank orthogrid rib cracks. Additionally, R&M also prepared a one-pager for the Single Mission Fuel Isolation Valve, which will fly for the first time on STS-105. R&M actively participated as a member of the SRB Integrated Electronics Assembly (IEA) Supportability Assessment Team, which was chartered to assess the capability of the current IEA inventory to support the planned Shuttle flight rate through the year 2020. R&M support included review of IEA failure history, statistical analysis and trending of failure data, and development of an IEA supportability model. R&M continued to review and support the Friction Stir Weld process as it transitions from the Preliminary Design Review (PDR) (Sept. 2000) to Critical Design Review (CDR) (scheduled September 2001). R&M also participated in an S&MA offsite meeting held at KSC to improve relations between United Space Alliance (USA) S&MA and MSFC S&MA. Issues were identified concerning the two S&MA offices and resolutions were proposed on how to better work as a team.

In support of the X-38 Deorbit Propulsion System (DPS) design development, R&M completed the development and formal release of the FMEA/CIL for the MSFC-developed Electrical Interface Panel (EIP) and Bolt Retention System (BRS). In development of the FMEA/CIL, R&M worked closely with in-house MSFC EIP and BRS design and test engineers to complete the FMEA and to identify and document rationale for retention for identified critical items.

In support of the International Space Station Nodes Project, R&M supported a Node 2/3 TIM with Nodes Project Office and ISS R&M personnel. The purpose of the TIM was to coordinate and resolve several R&M related issues resulting from the Node 2 DR2, as well as to establish a schedule for completion of the Node 2 FMEA/CIL to support Node 2 COFR. Per this schedule, the Node 2 FMEA/CIL will be updated and submitted to Houston by subsystem as each subsystem is completed with the final submittal in the September timeframe. Considerable effort has been spent updating the Node 2 FMEA/CIL and coordinating it with the appropriate Nodes

subsystem leads to get their concurrence. In support of Node 3 Environmental Control and Life Support System (ECLSS) development, R&M began the review and integration of the subcontractor developed FMEA/CIL for the Water Processor Assembly, and supported the In-process Review (IPR) for the Urine Processor Assembly Firmware Controller Power Module.

In support of the MSRR-1 team, R&M prepared a Fault Tree Analysis for the Quench Module Insert (QMI) loss of cooling during on-orbit operations failure scenario. The fault tree identifies the controls that are in place to mitigate the risk associated with the various failure causes. Additionally, R&M worked to close out several RIDs from the MSRR-EC CDR and Integrated Payload PDR.

In support of the g-LIMIT project, R&M began development of a failure rate prediction for the g-LIMIT hardware to support verification activities.

R&M developed and released a FMEA/CIL for the Solar-B X-Ray Telescope and Extreme Ultraviolet Imaging Spectrometer science instruments to support the Solar-B instruments CDR that begins in July.

4.2.2 Problem Assessment Center (PAC) Operations

HEI's PAC personnel processed and coordinated disposition of problem reports, supported launch preparation milestones, coordinated the MSFC Problem Assessment System, and operated the Corrective Action System (CAS). The PAC received and entered 32 new problem reports (PRs) into MSFC's Problem Reporting and Corrective Action (PRACA) System, coordinated MSFC interim closure of 30 PRs, received 27 prime contractor closure recommendations, supported MSFC full closure of 29 PRs, coordinated non-problem closure of five (5) problems, and performed 248 individual PR database updates and reviews. Six (6) SSME problem review boards were conducted, which dispositioned 24 of 24 problem reports presented. The PAC generated or updated trends for all SSME, RSRM, and SRB problems submitted as newly opened or for closure. The PAC supported nine (9) pre-launch milestones for STS-100, -104, and -105 in addition to coverage of the successful Level A countdown and launch of STS-100. This included providing open problems listing and counts, real-time meeting support, and/or issue analysis on open MSFC PRACA critical problems. In support for the launch attempts, we extracted and provided copies of KSC PRACA problems as they were entered at KSC for MSFC S&MA review during Level A countdown, and instructed the HOSC on use of the KSC PRACA system.

In problem system coordination, the PAC implemented, defined formats, and conducted three (3) SRB Problem Assessment System (PAS) status reviews for the SRB Chief Engineer and added an Export Control warning to MSFC PRACA data and coordinated a similar addition for Shuttle Program data systems. We also reviewed and discussed with NASA and/or prime contractor proposed revisions to ET, SRB, and RSRM problem reporting processes. We completed the PRACA Data Integrity Study, presented findings to the JSC Shuttle PRACA Coordinator and other Shuttle PRACA Center leads, and implemented process revisions to reduce the discrepancy rate and better control data integrity.

The PAC provided various problem data in support of NASA and MSFC analyses. Special activities included extracting, formatting, and organizing lists and tabulations of over 3,000

Shuttle Functional Criticality I/IR problems since 1987 for Independent Assessment's support of Shuttle Upgrades; developing and providing SSME deferral rates for in-house problems reported into MSFC PRACA; generating statistics on SRB closures/interim closures for 1999 thru May 2001; and providing In-Flight Anomaly data to the MSFC Shuttle Integration Office in support of Center metrics. These were in addition to regular monthly reporting of newly opened/newly closed MSFC PRACA problems and new opened shuttle element PRACA problems for presentation to the Human Exploration and Development of Space, quarterly generation of the Open Problems List, daily distribution of KSC Shuttle PRACA problems and the report from MSFC's resident office at KSC, daily maintenance of the Open Against Next Mission problem summary available on the web, and generation of various ad hoc reports on problem system activity.

In implementation and operation of the MSFC CAS, we received 25 potential CAS reports, screened 26 draft Recurrence Control Action Requests (RCARs), and initiated four (4) new RCARs. We received 12 responses from laboratory points of contact with either disposition rationale or response extension requests. We coordinated Corrective Action Board review of eight (8) RCARs, resulting in full closure of seven (7) RCARs. HEI also provided open RCAR status reports and discussion at the ISO Implementation Team and Focus Team meetings, issued monthly RCAR status and delinquent response reports, and defined, generated, and presented monthly metric charts of RCAR activities and statuses at the ISO Implementation Team. We participated in the Marshall Quality Counsel (MQC) – preparing and presenting trend and status charts on Corrective and Preventive Action topics. We continued with review and upgrade of various ISO documents, including submitting MWI 1280.2, "Customer Feedback" for DCB review and revised feedback MSFC Form 4306. We also participated on the "Customer Satisfaction" team to research, write and submit a new MPG, and draft overview training on the subject.

4.2.3 ALERT Program

HEI's ALERT support included both regular and special activities as personnel coordinated MSFC ALERT processing. HEI received 11 ALERT notifications, distributed all 11 ALERT announcements for MSFC review, and obtained 531 responses from MSFC project, contractor, and laboratory contacts. Two of these were coordinated with S&MA for quick release during the STS-100 mission freeze. HEI continued to work with MSFC ALERT Notification, Status, and Response system users to define contacts, prepared and conducted a large group training session attended by 34 contacts, and provided additional instruction and clarification to various individuals and small groups on its use. HEI supported the MSFC ALERT Coordinator at the Annual GIDEP Workshop in Kansas City and obtained appointment to GIDEP's Industry Advisory Group Steering Council (at the recommendation of the NASA ALERT Coordinator). We developed and presented a summary of ALERT activities to the Office and Directorate heads at the MSFC Quality Council.

4.3 Quality

Space Transportation

ET Quality Engineering (QE) participated in a Composite Nose Cone nonconformance review due to multiple mechanical property failures of the graphite/fiber material. QE also continued participation in qualification activities associated with the composite intertank access door.

SRB QE participated on the Booster Separation Motor (BSM) Cracked Insert Anomaly and the BSM Unburned Propellant Anomaly Resolution Teams. In addition, QE participated in a SRB BSM Phase II review held at Chemical Systems Division in San Jose, CA.

RSRM QE participated in review of current and past re-certification guidelines and reviewed proposed changes to the DPD 400/DRD4-20. RSRM QE also supported Phase I of the RSRM Master Verification Plan (MVP) audit efforts.

SSME QE continued to provide support for pre-test planning sessions, post-test data reviews and acceptance reviews associated with acceptance of flight engine assemblies and related components. QE also provided support for the continuation of the Block II SSME hot-fire vibration survey test series. QE represented S&MA in the investigation of viton rubber contamination found in HPFTP/AT unit 8018.

QE participated in the tear down analysis of the SRB Combined Receiver Decoder qualification test article at Cincinnati Electronics. QE reviewed CR S060614, the update of program requirement for Electrical Workmanship Standards. QE supported the MC-1 project Material Review Board (MRB) in the dispositions of Thiokol Discrepancy Reports. QE supported the MC-1 engine project in shutdown and project termination activities. QE also participated in the process of qualifying the Pyrotechnic Separator Assembly to be used in the X-38 Electrical Interface Panel qualification test.

Payloads

Payload QE provided support to Stanford University at Vandenberg Air Force Base for the Ground Operation Working Group, Mission Integration Working Group, and the Gravity Probe B Safety Technical Interchange Meeting.

QE provided support for the Solidification Using a Baffle in Sealed Ampoules (SUBSA) and Pore Formation Mobility Insert (PFMI) project drawing review working meeting at Tech Masters Inc.

A trip to Herndon, Virginia was made by QE to support the SPASE project and to gain insight into the quality assurance processes used at the SPASE contractor, AeroAstro. QE also prepared a QA Plan and an Inspection and Test Plan for the SPASE Project.

HEI QE reviewed and provided comments for the Materials Science Research Rack/Quench Module Insert (MSRR-1/QMI) VAS Subassembly, Insert Installer, and Release Mechanism Assembly drawings.

QE supported and participated in the Independent Annual Review for Observable Protein Crystal Growth Apparatus (OPCGA) conducted by the Marshall Systems Management Office. QE also revised the OPCGA Project Quality Plan.

Inspection and Test

Quality Assurance participated in the preparation and removal of the Hydrogen Slush Tank at Test Stand 115 and monitored and witnessed activities at Test Facilities 115, 116, and 300 including Vortex Chamber testing, Zero Boil-off testing, and Composite Chamber testing.

HEI QA witnessed X-38 and ProSEDS qualification testing. QA also witnessed testing of SUBSA, VCD, and Multipurpose Experiments Support Structure (MPES) project hardware. QA traveled to KSC to witness functional testing of the STES prior to launch. Receiving inspection was performed on Protein Crystal Growth (PCG), Glovebox Integrated Microgravity Isolation Technology (g-LIMIT), MSRR, Water Recovery Systems (WRS), and Oxygen Generation Systems (OGS) parts and materials. QA monitored and witnessed various verification activities conducted on the Gravity Probe-B (GP-B) Dewar and Experiment Assembly at Stanford University during this period.

ISO

QE personnel performed follow-up and closure of the one minor non-conformance report generated by National Quality Assurance, USA during the first triennial audit of MSFC. QE also provided support to the internal audit program. QE revised MPD 1280.1, "Marshall Management Manual," and participated in Directives Control Board reviews and resolution of comments for other Directives revised during this period. QE consulted with various organizations across the Center on implementation of the expanded scope and the ISO 9001:2000 revisions. QE participated on two teams working on processes for Customer Satisfaction and Continual Improvement. QE was the primary contributor for the new draft MPG 1470.1, "Continual Improvement" and assisted in presentation to the Marshall Quality Council.

Software Quality Assurance (SQA)

HEI SQA reviewed documents and provided revisions for the internal (ED14) baseline of the MSRR-1 Software Quality Assurance Plan. The document will be incorporated into the S&MA Plan for the project. SQA also reviewed the MSRR-1 CM Plan, the MSRR-1 Software V&V Test Plan, and the MSRR-1 Software Requirements Specification Volume I and provided comments and participated in the ED14 Software Review Board for Baseline of MSRR-1 documents. SQA successfully completed training and testing per Capability Maturity Model requirements.

4.4 Information Management (IM)

Information Management's most visible contribution to S&MA's as well as MSFC's operations was implementation of the Supervisor Safety Web Page (SSWP) application. IM performed six formal training sessions for Supervisors, Safety coordinators and Organization Administrators from civil service and contractor organizations. Numerous ad-hoc training sessions were also supported. IM then established privileges for 48 Organization Administrators, instructed them on SSWP use, and resolved questions and identified problems. A large percentage of the problems that were identified involved erroneous data submitted by the MSFC MEDIS database. IM repaired the SSWP data as necessary and worked with personnel from other organizations to correct the data at the source. Requested exceptions to application design were evaluated for merit and implemented on a case-by-case basis. IM revised the programs that automatically update the database to include the functionality to combine DA01, DD01 and DE01 employees under one entity, as requested by the MSFC Associate Director. Additionally, the automatic update programs were revised to correctly process the unusual "M-DI" organization code. The personnel and organizational update programs were revised to retain a worker's associations and privileges when changing groups within the same organization. The code changes were tested and the data was updated in development and in production. An IM representative attended the

June 2001 Contractor Safety Forum (CSF) to discuss data integrity and other implementation issues.

IM completed development and revision of the Approved Vendor List (AVL) and Limited Vendor List (LVL) applications. AVL and LVL provide information regarding approved sources for procurement of flight hardware and flight hardware parts and materials. IM also developed an application for use by S&MA in performing an Organizational Culture Assessment. The application was revised to remove previously identified fields that allowed user identification. Other development efforts included: 1) revisions to the RADAR update program due to code changes that improve processing speed, 2) revisions to the RADAR "blue" functionality to extend the time period determine late reporting, 3) revisions to the MSFC PRACA application to allow multiple lines for assessment comments in modules and reports, and 4) revisions to ALERTs reporting organizations and evaluators. Additional RADAR metrics programs were also designed and delivered to QS40 for approval prior to expenditure of development resources.

IM participated as team members for several process improvement efforts in order to determine database application requirements. IM and QS30 representatives performed a review of revised documents governing the MSFC hazardous operations reporting process to identify necessary revisions to the Inventory of Hazardous Operations (IHOPS) application. The application is scheduled for release by September 2001. IM participated in a process analysis meeting to determine preliminary requirements for a tool to aid in the production of standardized and integrated S&MA plans. IM also assisted S&MA in establishing the Safety Operations Center (SOC) by evaluating alternatives, providing technical recommendations, and providing instruction regarding the use of tools.

4.5 Human Exploration and Development of Space (HEDS) Assurance

During this period, the HEDS Assurance Group IA Team completed three (3) assessments, provided key participation in the HEDS IA Integrated ISS/STS Assessment Teams, participated in other ISS and Shuttle Program meetings and special teams, researched and updated HEDS IA risk items, and reviewed past findings for closure.

4.5.1 International Space Station (ISS) Independent Assessment

The completed ISS assessments were "De-orbit Propulsion Stage Propulsion Tankage Instrumentation," and "Node 2 Design Review #2 ECLS Issues." The final reports for the completed assessments were submitted as were the final reports for two previously completed assessments. Observations from these assessments are being documented and presented via the HEDS IA Office to the ISS Program Office for their review and attention. Additional topics have been briefed to the HEDS IA Office as potential assessments.

A number of Engineering Information Reports (EIRs) on ISS issues were prepared and delivered in response to emergent and short-notice requests for information by the HEDS IA Office. In addition, group personnel are assigned as Nodes 2 and 3, Multi-Purpose Logistics Module, and Italian HAB Module HEDS IA flight specialists.

4.5.2 Space Shuttle Independent Assessment

During this period, the HEDS Assurance Group Independent Assessment (IA) Team completed one Shuttle assessment, "Low Nitrogen Content in Confined Detonating Fuse Assembly PETN."

Final observations and recommendations from this assessment were forwarded to the appropriate program personnel. Additionally, personnel are participating with JSC HEDS IA personnel in a long-term team assessment, "Evaluation of Space Shuttle Upgrades and Priorities." A number of EIRs on Shuttle issues were prepared and delivered in response to emergent and short-notice requests for information by the HEDS IA Office.

4.6 Project Assurance

HEI Project Assurance (PA) personnel provided technical support and assessments of Space Shuttle flight readiness for the following S&MA reviews: ET/SRB Mate Milestone Reviews, STS-104 and STS-105 Orbiter Rollout Milestone Reviews, STS-104 Pre-Flight Assessments, RSRM (STS-104) and SSME (STS-104) Pre-launch Assessment Reviews and, STS-104 Mission Management Team Review Tagup.

In addition HEI provided support at the HOSC during the launch of STS-100, during the reporting period. PA supported the Safety Integration console from "Level A" through main engine cutoff. HEI Safety and Reliability provided ET support starting at Level A with RSRM and SRB support starting three hours prior to launch. No major issues on the MSFC elements were worked during the countdown and the launch occurred on the first attempt. HEI personnel supported the Technical Issues Briefings to Art Stephenson for STS-104 and provided project assurance support for the ET, SRB and RSRM S&MA Assurance Offices.

In support of the Space Shuttle S&MA Integration Office, the following tasks were performed: PA coordinated MSFC S&MA participation in three (3) Space Shuttle System Safety Review Panel Teleconferences, downloading presentation materials and providing copies for local participants. PA also reviewed the KSC Launch and Landing Critical Items List (CIL) waivers and Hazard Report (HR) updates and JSC Government Furnished Equipment (GFE) HR and CIL updates and changes.

PA supported the Shuttle Environmental Assurance Initiative (SEA) by attending monthly teleconferences and providing risk management expertise to the working group. PA reviewed the SEA risk evaluation data sheets, which are developed by the SEA working group to identify, evaluate, mitigate and track the risk of environmental issues associated with the space shuttle program. A total of 18 data sheets were evaluated and the resulting comments were provided to the S&MA Shuttle Integration office. PA also supported and prepared charts for the monthly HEDS telecon with the HEDS Enterprise Centers S&MA Directors

PA assisted S&MA Shuttle Integration in the development of the draft S&MA Space Shuttle Launch contingency plan. The drafted plan describes the S&MA role and actions required in the event of a Space Shuttle contingency during launch operations from the start of Level A support through Main Engine Cut Off. PA coordinated HEI Space Shuttle manpower requirements and personnel assignments with S&MA. During this period, HEI expanded the Shuttle support team by adding a PA engineer for RSRM. HEI also brought a new Space Shuttle Transition specialist on board to assist in developing transition plans for the remaining MSFC shuttle elements.

PA coordinated the Aerospace Advisory Panel (ASAP) visit, preparing briefing materials, setting up the conference room, setup and operation of all electronic presentations, compiling MSFC information packages and taking minutes during the exit briefing. The visit focused on the safety considerations of MSFC's Space Shuttle Upgrades: Solid Rocket Booster TVC Helium

Auxiliary Power Unit, Space Shuttle Main Engine Advance Health Monitoring System (AHMS), High Pressure Fuel Turbopump, Channel Wall Nozzle, and the External Tank Friction Stir Welding.

HEI PA assumed the role as S&MA Team Lead (Acting) for the following programs/projects: Advanced Cosmic-ray Composition Experiment for Space Station (ACCESS), Altus Cumulus Electrification Study (ACES), Burst Monitor Diffusion Module Inserts (DMI), Diffusion Processes In Molten Semiconductors (DPIMS), G-LIMIT, Gravity Probe B (GP-B), Program Microgravity Crystal Growth Demonstration (MCGD), Microgravity Glovebox (MGBX), SOLAR-B and Solar X-Ray Imager (SXI). For the above Programs/Projects HEI staff provided support in the following areas: Attended Program/Project Team meetings, participated in information meetings, participated in scheduled telecons, coordinated staffing and budget input, reviewed technical documents for accuracy and content, provided charts for Program/Project presentations, briefed QS01 staff on Program/Project RADAR charts information and coordinated HEI S&MA deliverables.

HEI PA personnel assisted with software definition software, gathered information and developed a database to assist in preparing DCASS Hours Charts for the Shuttle Integration office. PA was tasked by S&MA Shuttle Integration to research and determine at what point the SRB and SSME hardware are officially transferred to the government. The PA leads for each of these elements acted promptly and provided the required information on a short turn around.

In support of the X-38 De-orbit Propulsion Stage (DPS), PA personnel provided the following technical support and assessments: X-38/DPS Project planning and status, participated in the X-38 DPS Forward Structural Assembly (FSA) Static Load Pre-test meetings at Composite Optics, planning and preparation for the Pre-Acceptance Review at Aerojet, review of the Electrical Interface Panel FMEA/CIL, preparation of the design and testing procedures of the DPS/X-38 Separation System, test readiness review (TRR) and static load testing of the DPS FSA and provided input to the X-38/DPS Phase 0/1 Ground Safety Review. PA also participated in the Pre-Acceptance Review at Aerojet on the electrical, structural and material subsystems, and FSA test fixture structural failure analysis and corrective action.

In addition, HEI PA personnel assisted QS10 in the preparation of and communication with the PSRRB for the following payloads: LSE, SPASE, Demonstration Vehicle (SDV), and Delta L Microgravity Program.

4.7 Risk Management and Risk Assessment

4.7.1 Risk Management

HEI participated in the Risk Management Colloquium held at Ames Research Center on May 15 and 16. During the colloquium, the Risk Management Vision for the NASA S&MA community was shared and a number of other issues were discussed. These included a review of Risk Management requirements and interdependencies, a status of Continuous Risk Management training at each of the Centers, risk assessment tools currently used at NASA and a Risk Management program status. HEI also attended a 16 hour training course in project risk management. The course was sponsored by the MSFC EdTec office and was provided by International Institute for Learning, Incorporated and was taught by Dr. David Hulett.

4.7.2 Space Shuttle Probabilistic Risk Assessment (PRA)

During this reporting period, responsibility for work on the Space Shuttle Probabilistic Risk Assessment (PRA) project moved from the R&M group to Risk Assessment. An HEI MSFC PRA team member and the PRA Technical Lead traveled to each Prime contractor to get their buy-ins on the new PRA methodologies, to identify specific task and deliverable due date, and to address any modeling issues the Primes may have. The results of these meetings were presented to the Shuttle PRA Program Lead, (b) (4), and the rest of the Shuttle PRA team members during the April Shuttle PRA TIM at MSFC. Two additional MSFC PRA TIMs were held to discuss MSFC specific modeling details such as the naming scheme, model breakdown and program deliverables with HEI and USA-SRB representatives. An HEI PRA team member has started working on the conversion of SSME catastrophic Event Sequence Diagrams (ESD) into fault trees, and developing SAPHIRE inputs of the SSME catastrophic, ET LO2 System and SRB TVC/ Separation models. Several telecons and discussions were held with the Prime contractors and the PRA technical lead, on various PRA topics such as dependency matrix, master logic diagram, and modeling methodologies. An HEI PRA team member is also assisting in developing SRB models. In support of the MSFC SSME Project Office, a PRA team member participated in NASA Independent Assessment (IA)'s SSME Advance Health Monitoring System (AHMS) PRA telecons and TIM with Rocketdyne, MSFC SSME Project Office, NASA-Langley, and Futron. Finally, PRA team members attended the second NASA PRA Workshop held at University of Virginia sponsored by Code Q. The workshop gave the participants insights into the various PRA projects currently going on within NASA and served as a forum to exchange ideas.

4.7.3 Reliability Prediction & Risk Assessment

HEI Risk Assessment (RA) presented a briefing titled "SSME Component Reliability Evolvment" to the SSME Project Office. This presentation showed the component breakdown of the 1999 PRA results from Quantitative Risk Assessment System (QRAS) for the current Block IIA and Block II configurations. Extrapolations of these risk numbers to previous and future SSME configurations were also presented. RA has provided support and input to several problem resolution teams working on potential flight issues during this reporting period. RA assisted on two BSM issues (unburned propellant and throat cracking) by reviewing risk assessments for each of them. RA has been supporting the RSRM FSM-9 pocketing erosion Unexpected or Unexplained Event or Condition (UUEC) by conducting independent statistical analysis of data of interest to the team. RA is also assisting the SRB project by reviewing Thermal Protection System (TPS) testing requirements. Test data are being analyzed to examine the process capability. Particular attention is being paid to the within component variation versus component-to-component variation. The goal is to reduce TPS sample size requirements while maintaining an effective screen.

5.0 COST REDUCTION ITEMS

Our continuing cross-utilization of employees, continuous analysis of work in progress to assure that application of resources meets the needs of the task, and the judicious acquisition and distribution of tools to enhance the efficiency of all team members allow us to minimize cost to the customer.